

1969

**OPERATING
SUMMARY**

UNION

water system

LIBRARY COPY

MAR 25 1971

**ONTARIO WATER
RESOURCES COMMISSION**

ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations

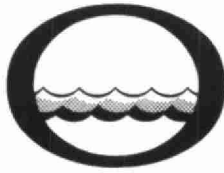
**LABORATORY LIBRARY
ONTARIO WATER RESOURCES COMMISSION**

Copyright Provisions and Restrictions on Copying:

This Ontario Ministry of the Environment work is protected by Crown copyright (unless otherwise indicated), which is held by the Queen's Printer for Ontario. It may be reproduced for non-commercial purposes if credit is given and Crown copyright is acknowledged.

It may not be reproduced, in all or in part, for any commercial purpose except under a licence from the Queen's Printer for Ontario.

For information on reproducing Government of Ontario works, please contact ServiceOntario Publications at copyright@ontario.ca



Water management in Ontario


Ontario
Water Resources
Commission


135 St. Clair Ave. W.
Toronto 195
Ontario

The operating efficiency and financial status of the water treatment facilities operated for you in 1969 are presented in the following pages.

The regional operations engineer's comments and the statistical data will assist you in gauging the plant's level of performance. A new flow chart and up-to-date design data are also provided.

Various divisions and sections within the Commission have co-operated in providing what we trust is an accurate and concise annual operating summary.


D. S. Caverly,
General Manager.


D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

CONTENTS

Title page.	1
Flow diagram	2
Design data	3
'69 Review	4
Project costs	8
Process data	12

ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN
D. J. Collins

VICE CHAIRMAN
J. H. H. Root, M. P. P.

COMMISSIONERS
H. E. Brown
D. A. Moodie
L. E. Venchiarutti

GENERAL MANAGER
D. S. Caverly

ASSISTANT GENERAL MANAGERS
L. E. Owens
K. H. Sharpe
F. A. Voigt
A. K. Watt

COMMISSION SECRETARY
W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

Director
D. A. McTavish

Assistant Director
C. W. Perry

Regional Supervisor
P. J. Osmond

Operations Engineer
R. E. Brown

135 St. Clair Avenue West
Toronto 7

UNION
water system

operated for the

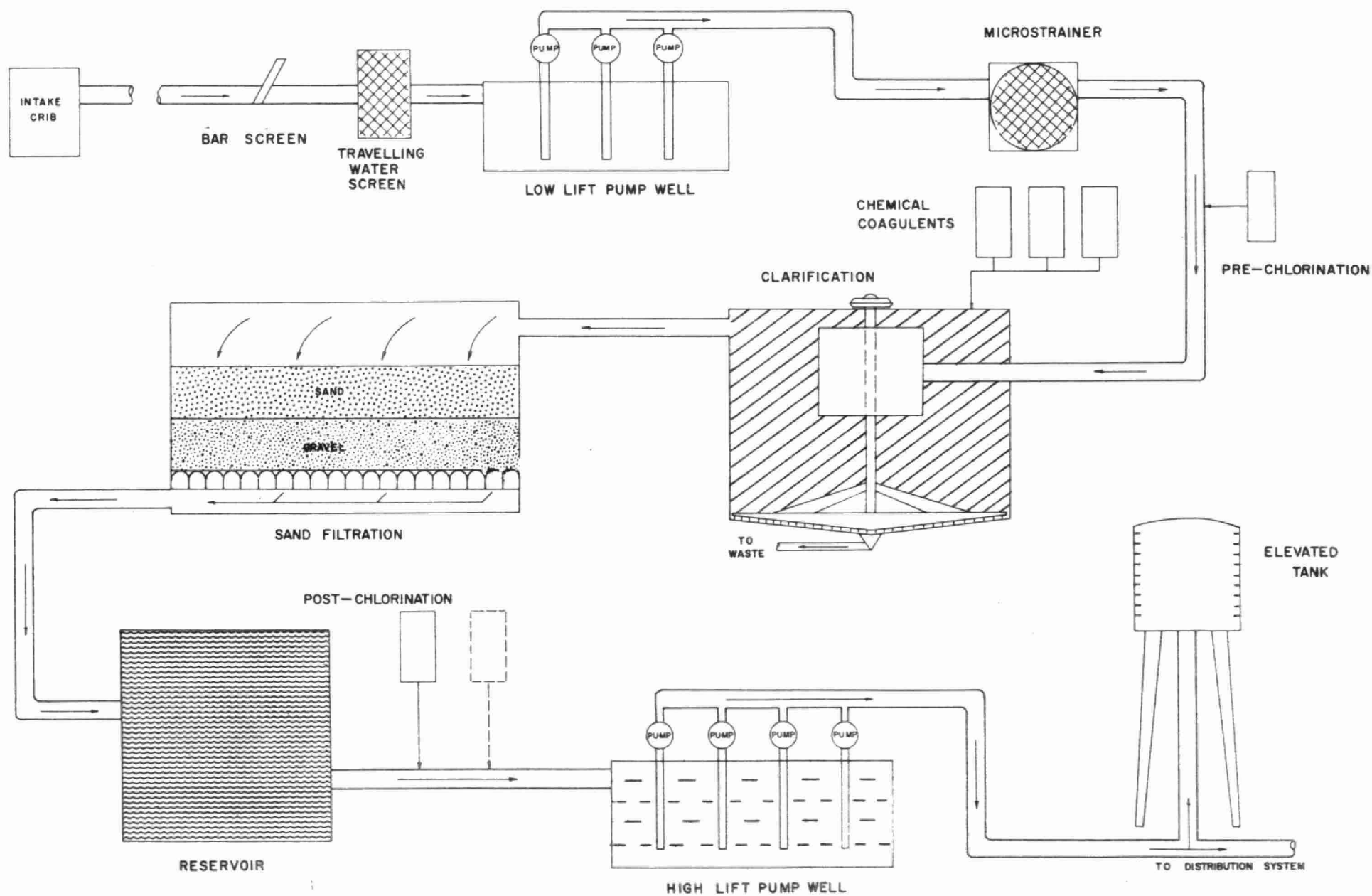
TOWN OF LEAMINGTON
TOWN OF ESSEX
TOWNSHIP OF GOSFIELD NORTH
TOWNSHIP OF GOSFIELD SOUTH
TOWNSHIP OF MAIDSTONE
TOWNSHIP OF MERSEA
H. J. HEINZ COMPANY OF CANADA LIMITED

by the

ONTARIO WATER RESOURCES COMMISSION

1969 ANNUAL OPERATING SUMMARY

UNION WATER TREATMENT PLANT PLANT FLOW CHART



DESIGN DATA

NOMINAL CAPACITY

7.6 MGD

RAW WATER SOURCE

Lake Erie

CAPACITY OF UNITS

Intake: 32 mgd @ 3.5 ft/sec avg. vel.

Low Lift: #1 2.16 mgd @ 100' head

#2 4.32 mgd @ 100' head

#3 4.32 mgd @ 100' head

#4 2.16 mgd @ 100' head

Combined 11.5 mgd @ 100' head

Microstrainer 7.6 mgd (design)

Clarifier: 8 MGD (design)

Filters: 8.0 MGD @ 2.15 gpm/ft²

High Lift: #6 2.60 mgd @ 200' head

#7 3.75 mgd @ 200' head

#8 5.19 mgd @ 200' head

#9 10.35 mgd @ 200' head

#10 1.15 mgd @ 200' head

INTAKE

Combined High Lift Capacity 24.3 mgd @ 200' head

10' dia steel bellmouth in 18' x 18' timber crib

Depth above crib - 15 ft (minimum)

Pipe Size: 1400 ft of 54" dia asbestos-coated corrugated steel pipe - about $\frac{1}{4}$ mile to plant

SCREENING

Coarse Screens - 3" cc

Fine Screens - $\frac{1}{4}$ " mesh travelling screens

MICROSTRAINER

One - 10 ft dia x 10'

Fabric: MKI (35 microns)

SEDIMENTATION

Type: Graver Reactivator

Size: One 94 ft dia x 19 ft swd

Volume: 0.823 mil gal

Detention: 2.5 hr @ 8.0 mgd

Overflow: 1160 gpd/ft² @ 8.0 mgd

FILTERS

Type: Gravity sand filter - 27" sand depth

Size: Four 18' x 36' double filters

Rate: 2.15 gpm/ft² @ 8.0 mgd

Backwash rate: 13 gpm/ft²

Also have Palmer surface jet wash

CHLORINATION

Three Wallace & Tiernan 2000 lb/day

STORAGE

Reservoir: 1.73 mil gal

Elevated Tank: .33 mil gal

'69 REVIEW

GENERAL

The Union Water System consists of a 7.6 mgd water treatment plant complete with low lift pumping station, micro-strainer, clarifier, rapid sand filters, chemical feeders, chlorination, clear water reservoir, high lift pumps, an elevated tank and two booster pumping stations. The system provides water to the Towns of Essex and Leamington, portions of the Townships of Gosfield North, Gosfield South, Maidstone and Mersea and the H. J. Heinz Company of Leamington.

The system is operated by a staff of ten, headed by superintendent H. Sanger. Staff coverage is provided 24 hours per day.

No major treatment problems or mechanical or electrical failures were encountered during the year. All reports from Ontario Water Resources Commission head office technical staff indicated that the plant and equipment were being maintained in excellent condition.

The annual certificate awarded to the best-operated water treatment plant within the OWRC is prominently displayed for the second year in succession.

Further progress was made towards expansion of the plant. Detailed engineering plans were completed, tenders were let and a contract awarded to Schwenger Construction Limited. Approval by the Ontario Municipal Board was obtained and final agreements were signed by all participants.

Construction of the plant expansion is scheduled for completion in September, 1970. The work will include installation of an additional low lift pump and microstrainer, and the construction of a second clarifier.

EXPENDITURES

The total system operating cost of \$146,743.50 was higher than in 1968 by \$7,896.76 or 5.7%. The production cost of water over the past ten years ranged from 7.24 to 10.11 cents per 1,000 gallons. The increased unit cost in 1969 was attributed, as in 1968, to both increased operating costs and lower flows as a result of a wet summer. These costs were based on the common area operating cost and the metered water to all participants. The ten-year average operating cost was 8.36 cents per 1,000 gallons.

PLANT FLOWS

(a) Plant Output

During 1969 a total of 1,446.19 million gallons of water was treated and pumped from the plant as measured by meter No. 1. This reading compares very closely with the cumulative readings of the area meters. The total plant output during 1969 was 2.7% below the 1968 level and approximately 4% below the 1967 level, owing in both years to ample rainfall in June and July, the period during which heavy irrigation is normally practised. The average daily flow of 3.95 million gallons represented 52% of plant design capacity (7.6 mgd). The maximum daily flow of 7.73 million gallons represents 102% of plant design capacity for continuous operation

(b) Consumption of Participants

Consumption by the Townships of Gosfield South and Maidstone increased significantly while consumption by the Townships of Gosfield North and Mersea and the Towns of Essex and Leamington decreased slightly during 1969. The H. J. Heinz Company continued at its 1968 consumption level. Each participant's share of the total consumption, with one exception, remained in its same relative position from 1960 to 1969, with Heinz being the largest user at approximately 40%. During 1969, Maidstone, traditionally the smallest consumer, showed a 31.6% increase to 2.1% of the total, exceeding the consumption of Mersea. There were no other major changes in 1969 over the 1968 percentages.

As in 1968, Mersea, Gosfield South and Maidstone used more than twice their contracted minimums. Consumption by Leamington was slightly below its 400 million gallon allotment for the second year in a row. Mersea, Gosfield South and Maidstone consumed many times in excess of their agreed daily maximums, based on an average daily basis during the maximum month. However, no penalties will be applied until completion of the plant expansion.

(c) Peak Demands

Peak demands on the plant during 1969 approached critical levels for periods of from two to ten days as follows:

1 day	(September 12)	81% of capacity
2 days	(September 11 to 12)	86% "
3 days	(September 10 to 12)	88% "
4 days	(September 9 to 12)	89% "
5 days	(September 8 to 12)	89% "
6 days	(September 8 to 13)	90% "
10 days	(August 26 to September 4)	86% "

The highest rates for the 4-, 6- and 12-hour periods occurred on September 12, the day of highest plant output. The peak month was August, when 166.362 million gallons were pumped. This represented an average daily flow of 5.4 mil. gal., which was 70.5% of the plant capacity.

Treated water flows exceeded design capacity for continuous operation about 2% of the time, compared with 1% of the time in 1968 and 7.5% of the time in 1967.

PROCESS CHEMICALS

A total of 48,023 gallons of a 50% solution of Alum ($\text{Al}_2\text{O}_3 \cdot 28\text{H}_2\text{O}$) was used as a coagulant in the operation of the clarifier during 1969. Dosage rates of 50% solution ranged from 12 to 25 mg/l and averaged 20 mg/l.

During the latter portion of 1969, a total of 6767 pounds of sodium silicate and 1600 pounds of sodium bicarbonate was used, on a trial basis, to aid coagulation. Use was intermittent but normally at a rate of 3.75 mg/l of sodium silicate and 0.7 mg/l of sodium bicarbonate.

From June to October, 1785 lbs. of activated carbon were used to control taste and odour for a dosage rate averaging 2.1 mg/l.

During 1969, an average dosage of 2.0 mg/l of chlorine was used for pre-chlorination to maintain a residual of 0.15 mg/l. An average dosage of 0.7 mg/l was used in post-chlorination to maintain a residual of 0.5 mg/l in the treated water pumped to the distribution system. A total of 40,800 pounds of chlorine was used, a slight reduction from 1968.

WATER QUALITY

Although the raw water was slightly less hard than in 1968, it is still considered to be a moderately hard water. Hardness is not changed by the treatment process now in use.

Alkalinity was reduced but the iron content showed a significant increase over the previous year. However, treatment continued to reduce the iron content to well below the recommended limit of 0.3 mg/l. Colour content remained below the recommended upper limit continuously.

Raw water chloride content averaged far below the recommended limit, while fluoride samples in both raw and treated water stayed well below desirable limits. Traces of phenol in the raw water were removed during treatment.

Raw water turbidity averaged 18.0 JTU during 1969, slightly lower than the 1968 level, with the peak occurring in November. The turbidity of the clarified water averaged 4.1 JTU, an increase from 1.7 JTU in 1968. This reduction in clarifier turbidity removal efficiency persisted throughout the year, although efficiency was improved through the trial use of sodium silicate and sodium bicarbonate to aid coagulation later in the year. Filtered water turbidity remained at a very satisfactory level of 0.2 JTU, indicating a removal efficiency of 99%.

The average number of coliforms per 100 ml of raw water sample was 1121 with values for the 49 samples ranging from 0 to 15,000. The average value did not change significantly from 1968. One sample containing 80,000 coliforms per 100 ml of raw water sample was deleted in computing averages, as it appeared to be erroneous. Of a total of 601 samples of treated water taken throughout the distribution system, only 21 showed the presence of coliforms. Low coliform counts in seven of the 12 samples taken September 2 from the distribution system did not appear in a special set of samples taken September 4. The remaining 14 samples did not show a high enough count to warrant further investigation by the Department of Health, who sample the system.

The average algae concentration in the raw water was 4708 A. S. U. /100 ml, not significantly changed from 1968. Actual counts ranged from 834 to 9452 units. These values are quite high in comparison to most areas in the Great Lakes.

CONCLUSIONS

During 1969, the maximum demand equalled or exceeded 86% of the plant capacity over periods of from two to ten days. The normally critical demand period resulting from high irrigation usage was again averted because of adequate rainfall during this period. The total output for the year decreased by 2.7 percent and the peak month was 3.7 percent higher than in 1968. The plant load factor was 0.52 compared with 0.53 in 1968, 0.55 in 1967, 0.54 in 1966 and 0.55 in 1965. The cost of production was 10.11 cents per 1,000 gallons or 2.02 cents per ton compared with 9.37 and 1.87 cents respectively in 1968.

Turbidities in the raw water followed much the same pattern as in earlier years, with the peak occurring in November. The high turbidity levels which occurred in April of 1968 were not repeated in 1969. Overall raw water quality does not appear to have changed noticeably during the past few years.

Treated water continued to remain at high quality levels throughout the year.

PROJECT COSTS

NET CAPITAL COST (Estimated) \$3,841.799.96

Note: The participants' share of net capital cost varies each year on the basis of consumption.

DEBT RETIREMENT BALANCE AT CREDIT (Sinking Fund) December 31, 1969

Essex	\$ 90,767.19
Leamington	143,827.53
H. J. Heinz	195,532.22
Gosfield North	15,159.20
Gosfield South	31,073.20
Mersea	56,277.76
Maidstone	<u>16,120.90</u>
 TOTAL	 \$ <u>548,758.00</u>

1969 COSTS TO EACH PARTICIPANT

TOTAL

Essex	\$ 68,607.28
Leamington	115,840.79
H. J. Heinz	167,712.43
Gosfield North	12,929.40
Gosfield South	28,870.31
Mersea	47,294.56
Maidstone	<u>14,339.26</u>
	 \$ <u>455,594.03</u>

NET OPERATING

Essex	\$ 18,523.64
Leamington	39,528.37
H. J. Heinz	57,179.41
Gosfield North	3,537.36
Gosfield South	9,882.12
Mersea	15,062.60
Maidstone	<u>3,030.00</u>

\$146,743.50

DEBT RETIREMENT

Essex	\$ 12,988.21
Leamington	19,193.60
H. J. Heinz	27,513.23
Gosfield North	2,342.62
Gosfield South	4,689.98
Mersea	8,304.44
Maidstone	<u>2,494.92</u>

\$ 77,527.00

RESERVE

Essex	\$ 3,009.36
Leamington	3,571.55
H. J. Heinz	5,556.21
Gosfield North	572.11
Gosfield South	1,178.76
Mersea	1,868.95
Maidstone	<u>483.96</u>

\$ 16,240.90

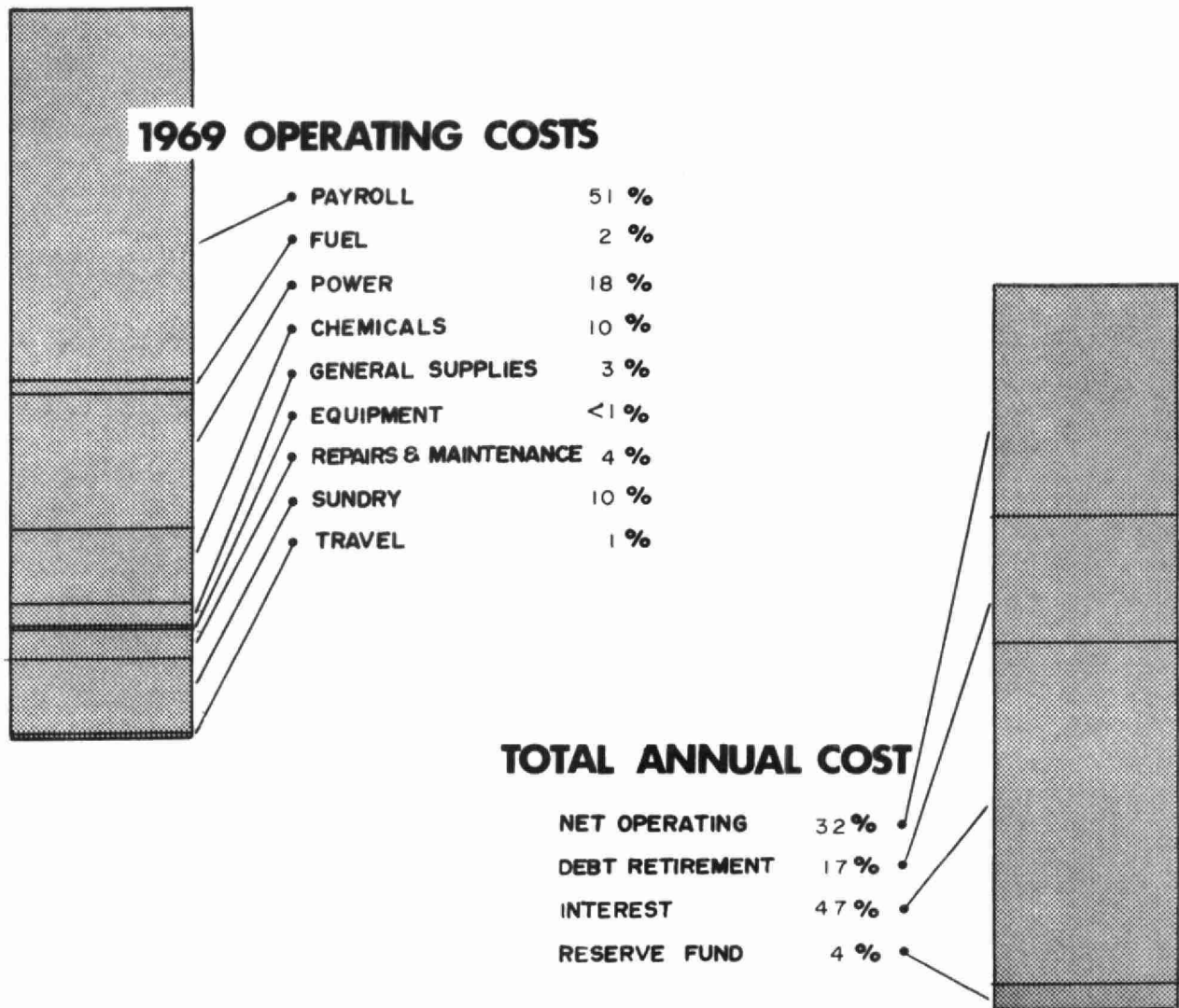
INTEREST CHARGED

Essex	\$ 34,086.07
Leamington	53,547.27
H. J. Heinz	77,463.58
Gosfield North	6,477.31
Gosfield South	13,119.45
Mersea	22,058.57
Maidstone	<u>8,330.38</u>

\$215,082.63

TOTAL COST

\$455,594.03



Yearly Operating Costs

YEAR	MILLION GALLONS TREATED	TOTAL OPERATING COSTS *	COST PER THOUSAND GALLONS
1965	1538.25	\$122,797.19	\$ 7.98
1966	1486.51	123,341.12	8.30
1967	1506.65	130,349.36	8.65
1968	1465.52	137,283.49	9.37
1969	1445.28	146,059.93	10.11

* Common Area

Monthly Operating Costs

MONTH	TOTAL	PAYROLL	CASUAL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY	TRAVEL
JAN	10733.26	8611.90	-	-	1751.58	-	289.13	-	25.40	55.25	-
FEB	9628.20	5784.44	-	577.47	2300.20	-	301.78	5.25	361.38	172.43	125.25
MAR	9963.86	5784.44	-	408.11	1649.52	605.39	254.97	-	663.07	559.66	38.70
APRIL	9450.98	5967.42	24.00	406.11	1806.84	627.04	355.70	-	10.82	210.75	42.30
MAY	10379.59	5512.87	-	235.02	2285.90	1202.15	388.92	-	454.68	177.80	122.25
JUNE	9686.37	5849.30	-	360.89	2230.22	-	223.64	107.52	260.64	269.91	384.25
JULY	12481.78	6208.92	-	76.89	2064.18	1725.19	431.03	300.00	1360.18	117.04	198.35
AUG	13290.65	7934.35	-	-	2558.00	1382.27	483.86	-	667.96	144.56	119.65
SEPT	11656.28	5883.11	-	39.65	2572.96	2337.96	211.22	-	300.34	133.44	177.60
OCT	22957.02	5797.34	-	2.33	2954.86	3246.13	407.03	172.00	80.49	10079.04	217.80
NOV	10091.99	5877.54	-	140.40	1988.44	869.12	510.68	-	374.32	221.04	110.75
DEC	15739.95	5647.02	-	339.52	2370.84	2103.91	1110.25	193.94	1189.98	2560.44	224.05
TOTAL	146059.93	74858.65	24.00	2586.39	26533.54	14099.16	4967.81	778.71	5749.26	14701.46	1760.95
UNION EAST	145.25				144.25					1.00	
UNION WEST	538.32				337.92					200.40	
GRAND TOTAL	146743.50	74858.65	24.00	2586.39	27015.71	14099.16	4967.81	778.71	5749.26	14902.86	1760.95

PROCESS DATA

PLANT OUTPUT in millions of gallons

MONTH	TOTAL FLOW	MAXIMUM DAY FLOW	MINIMUM DAY FLOW	AVERAGE DAILY FLOW	CUMULATIVE TOTAL
January	93.94	3.76	1.82	3.03	93.94
February	71.40	3.37	1.42	2.55	165.34
March	81.78	3.54	1.34	2.64	247.12
April	98.32	4.56	1.78	3.28	345.44
May	115.22	5.34	1.83	3.72	460.66
June	120.95	5.64	2.17	4.03	581.61
July	131.28	5.30	2.12	4.23	712.89
August	170.34	7.38	5.26	5.49	883.23
September	180.40	7.73	2.62	6.01	1063.63
October	141.44	5.96	2.20	4.56	1205.07
November	120.09	5.60	2.15	4.00	1325.16
December	121.03	5.17	2.12	3.90	1446.19
Total	1446.19	-	-	-	1446.19
Average	120.52	-	-	3.95	-

CONSUMPTION OF PARTICIPANTS
(adjusted flows)

PARTICIPANT	CONSUMPTION (MILLIONS OF GALLONS)									
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
GOSFIELD S.	16.34	37.29	51.74	74.96	75.01	99.12	87.37	102.66	83.12	93.82
GOSFIELD N.	9.95	13.13	21.60	29.53	23.35	30.06	32.93	31.06	35.82	27.81
MERSEA	55.70	79.35	99.51	137.71	127.96	168.68	158.53	165.23	160.61	152.48
LEAMINGTON	335.00	399.91	404.41	455.70	407.97	449.64	416.38	416.57	391.85	378.71
HEINZ	500.00	534.50	557.04	520.40	541.00	595.00	594.00	572.23	573.48	578.71
ESSEX	130.00	158.58	190.04	177.07	174.46	177.72	179.12	195.49	197.82	183.72
MAIDSTONE	5.41	6.37	8.45	7.48	9.52	18.03	18.19	23.42	22.82	30.03
TOTAL	1052.40	1229.63	1332.79	1402.63	1359.27	1538.25	1486.52	1506.66	1465.52	1445.28

PARTICIPANT	PERCENTAGE OF TOTAL									
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
GOSFIELD S.	1.6	2.0	3.9	5.4	5.5	6.4	5.9	6.8	5.7	6.5
GOSFIELD N.	0.9	1.1	1.6	2.1	1.7	1.9	2.2	2.1	2.4	1.9
MERSEA	5.3	6.5	7.4	9.8	9.4	11.0	10.7	11.0	11.0	10.6
LEAMINGTON	31.8	32.5	30.5	32.5	30.0	29.2	28.0	27.6	26.7	26.2
HEINZ	47.5	43.5	41.8	37.1	39.8	38.8	40.0	38.0	39.1	40.0
ESSEX	12.4	12.9	14.3	12.6	12.8	11.5	12.0	13.0	13.5	12.7
MAIDSTONE	0.5	0.5	0.6	0.5	0.8	1.2	1.2	1.5	1.5	2.1
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

PARTICIPANT	AGREED ANNUAL MINIMUMS		ANNUAL CONSUMPTIONS										AGREED DAILY MAXIMUMS	1969 MAXIMUM MONTH DAILY AVERAGE
	* ORIGINAL	• REVISED	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969		
	MILLION GALLONS												1000 GALS.	1000 GALS.
H.J. HEINZ	520.0	520.0	500.0	534.5	557.0	520.4	541.0	595.0	594.7	572.2	573.5	578.7	3500	2233
LEAMINGTON	425.0	400.0	335.0	333.9	404.0	455.7	408.0	449.0	416.4	416.6	391.8	378.7	2100	1813
ESSEX	160.0	160.0	130.0	158.6	139.0	177.1	174.5	177.7	179.1	195.5	197.8	183.7	752	713
MERSEA	12.5	70.0	55.7	79.8	99.5	137.7	126.0	168.7	158.5	165.2	160.6	152.5	40	652
GOSFIELD S	18.5	40.0	16.3	37.3	51.8	74.9	75.0	93.1	87.4	102.7	83.1	93.8	60	400
GOSFIELD N	23.5	20.0	10.9	13.1	21.5	23.5	23.3	30.1	32.0	31.1	35.8	27.8	80	118
MAIDSTONE	12.0	10.0	5.4	6.4	9.5	7.5	9.6	10.1	10.2	23.4	22.8	30.0	45	129
TOTAL	1176.5	1231.0	1159.4	1220.0	1302.4	1402.8	1359.4	1531.2	1406.8	1509.8	1465.5	1445.2	6577	6058

* AS PER ORIGINAL AGREEMENT

** REVISED EFFECTIVE JANUARY 1, 1963

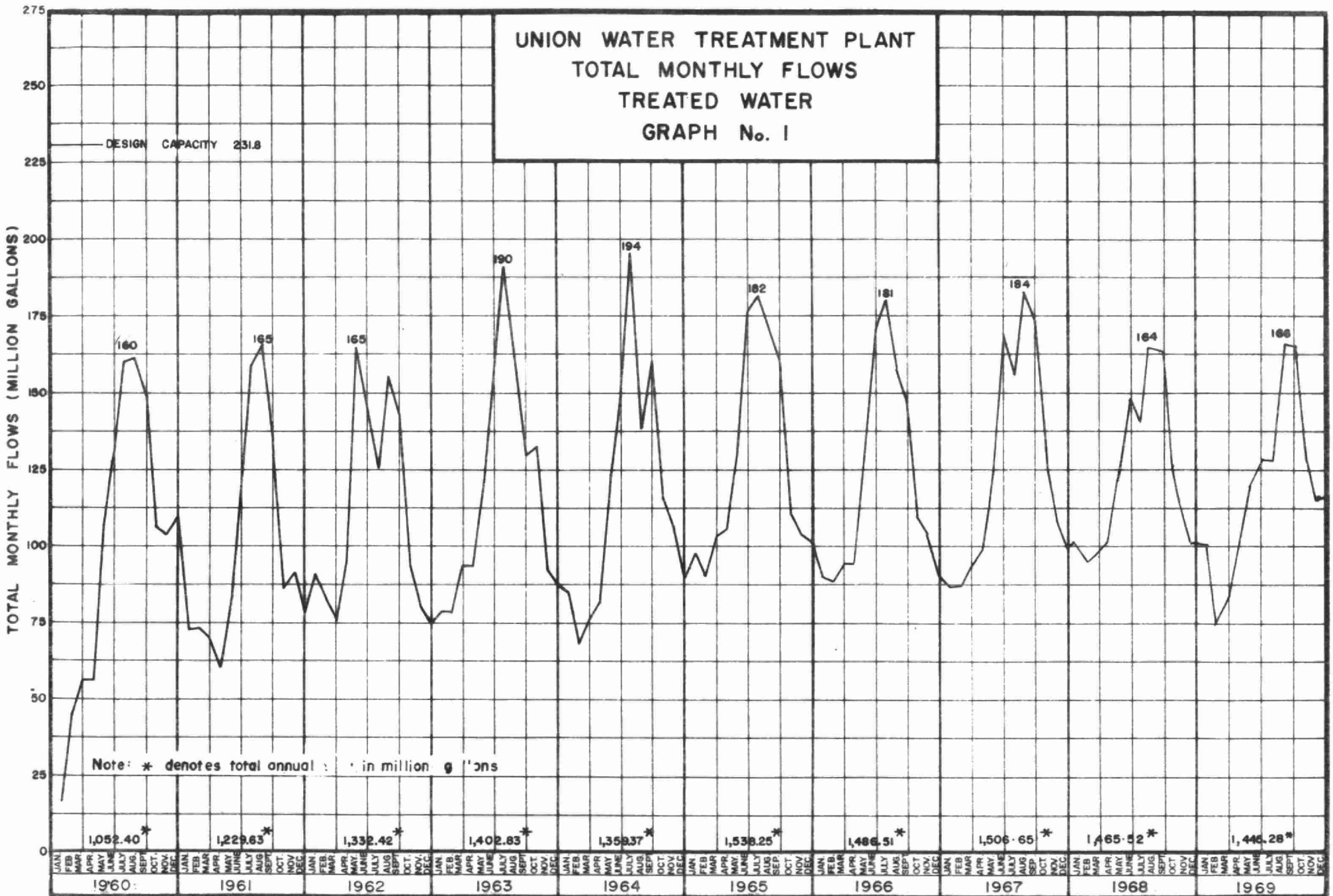
UNION WATER SYSTEM

1969 FLOW DATA

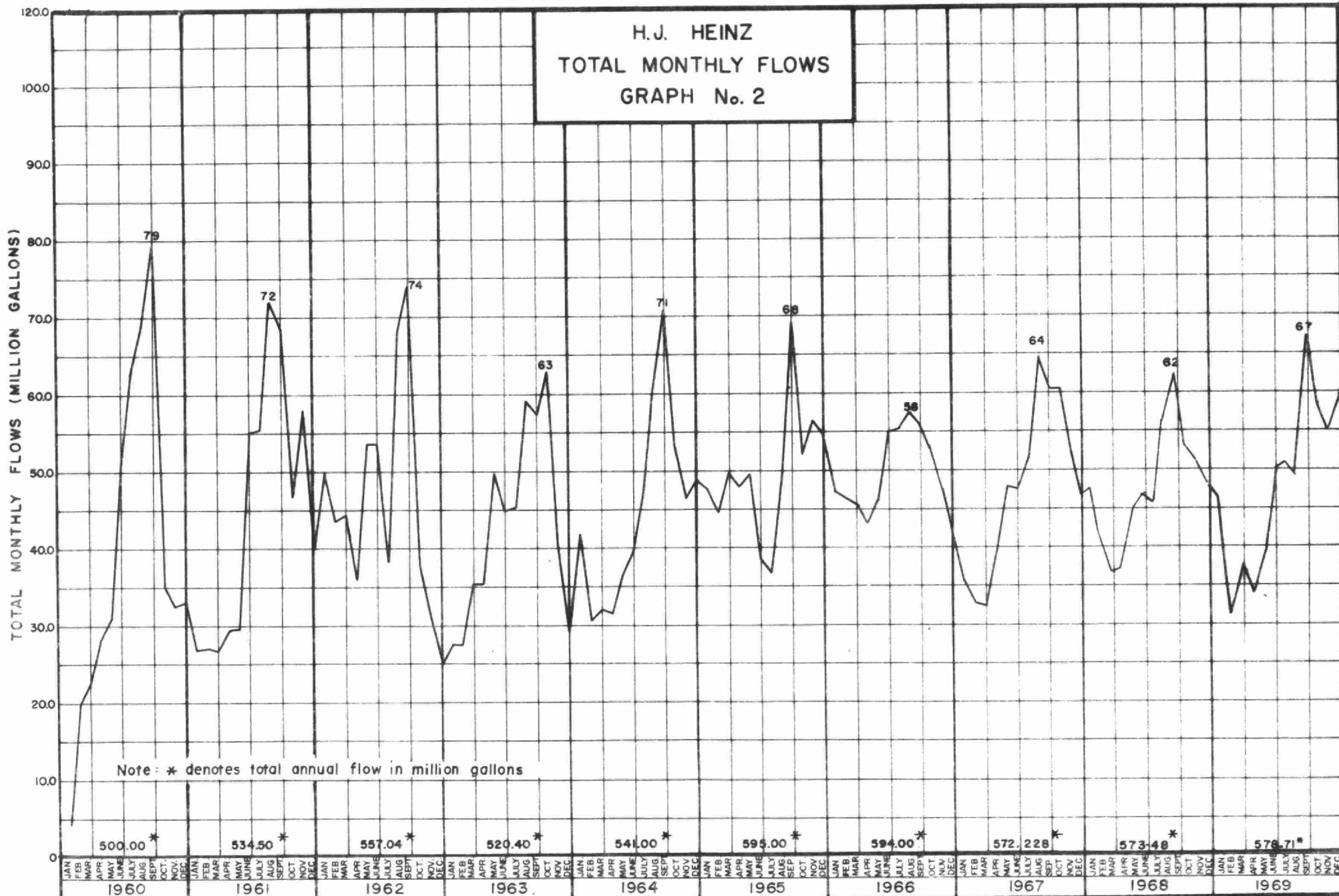
ADJUSTED MONTHLY FLOWS BY PARTICIPANT

Flows expressed in Million Gallons (MG)

Month	Gosfield South	Mersea	Leamington	Essex	Maidstone	Gosfield North	Heinz	Total
January	3.899	7.971	23.363	14.834	2.152	2.628	46.077	100.924
February	3.241	6.625	19.419	12.330	1.788	2.185	30.949	76.537
March	5.185	9.402	19.492	10.533	1.579	1.762	37.710	85.663
April	7.464	13.536	28.060	15.164	2.273	2.536	34.269	103.302
May	10.809	18.491	34.427	15.000	2.461	1.808	39.358	122.354
June	10.336	17.680	32.918	14.342	2.353	1.728	50.093	129.450
July	8.336	13.589	37.784	14.867	2.220	1.813	50.708	129.317
August	12.401	20.214	56.207	22.115	3.303	2.696	49.426	166.362
September	11.831	15.417	44.193	21.155	2.542	3.553	66.987	165.678
October	8.560	11.155	31.976	15.307	1.839	2.570	58.128	129.535
November	6.027	9.434	26.087	14.397	3.859	2.323	55.388	117.515
December	5.726	8.963	24.785	13.679	3.666	2.207	59.620	118.646
Totals 1969	93.815	152.477	378.711	183.723	30.035	27.809	578.713	1445.283
Totals 1968	83.124	160.614	391.845	197.816	22.820	35.817	573.480	1465.516
% Diff. 69/68	+12.9	-5.1	-3.4	-7.1	+31.6	-22.4	+0.9	-1.4



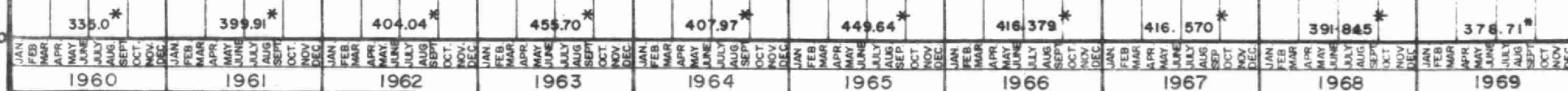
H.J. HEINZ TOTAL MONTHLY FLOWS GRAPH No. 2



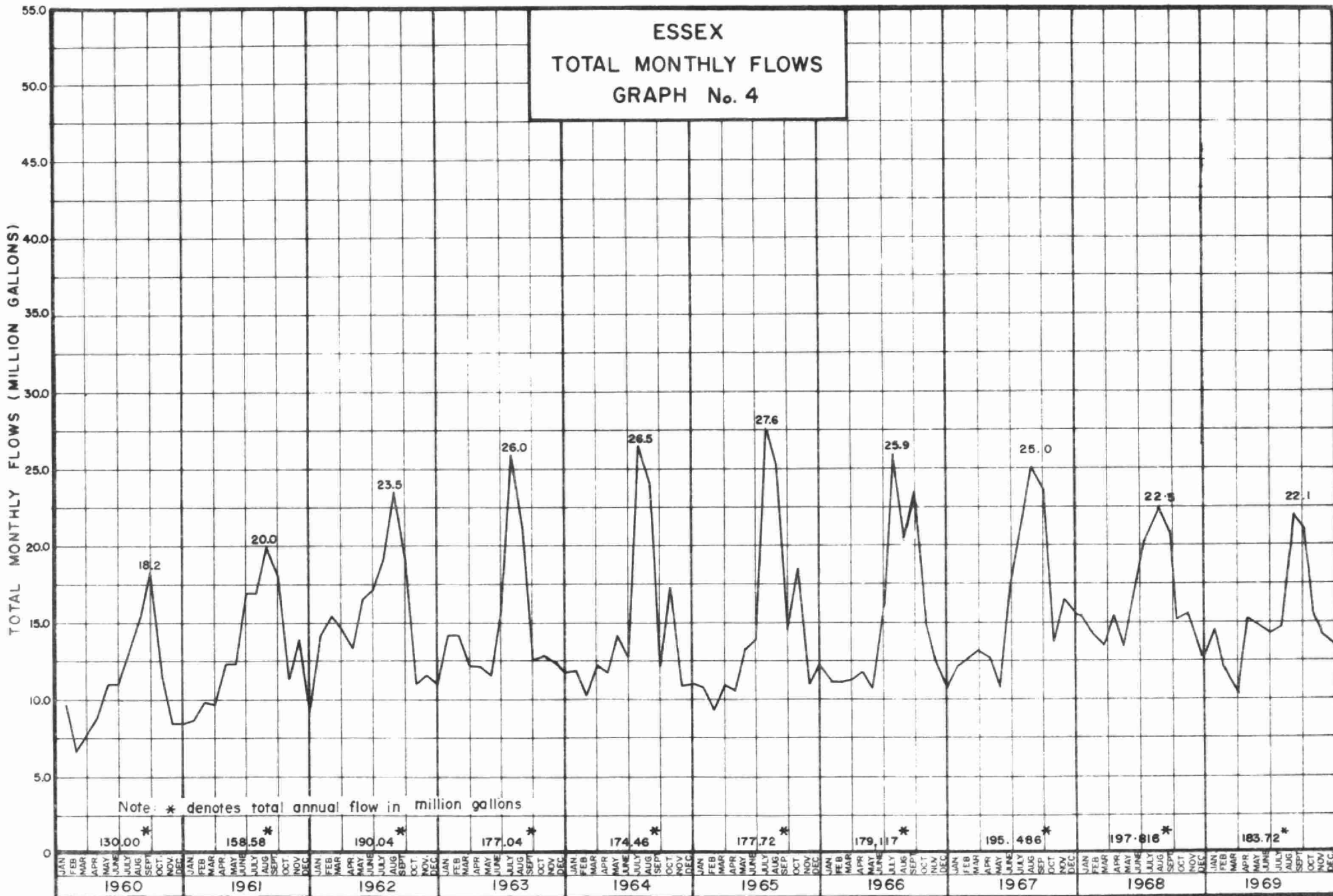
LEAMINGTON TOTAL MONTHLY FLOWS GRAPH No. 3

TOTAL MONTHLY FLOWS (MILLION GALLONS)

Note: * denotes total annual flow in million gallons



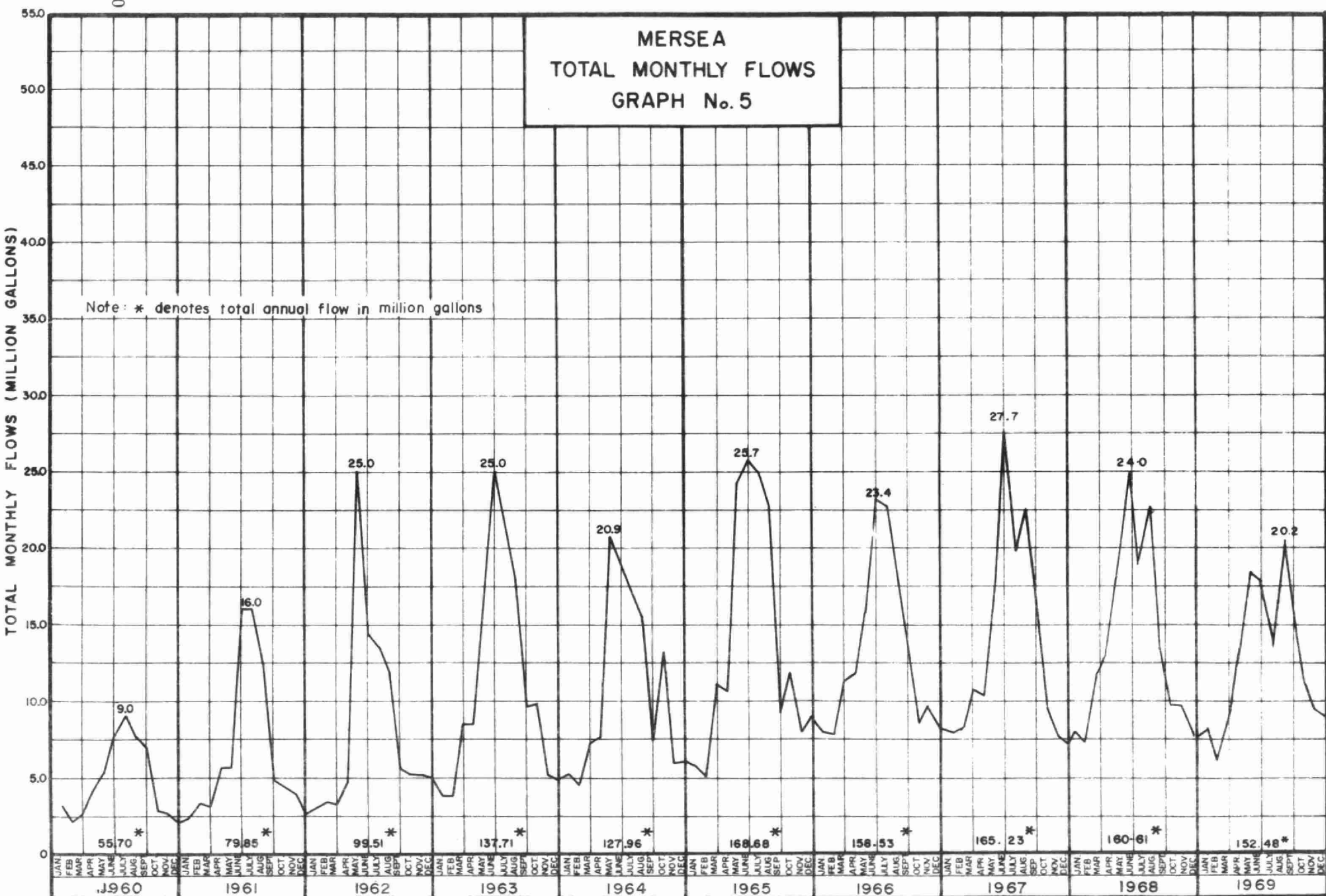
ESSEX TOTAL MONTHLY FLOWS GRAPH No. 4



MERSEA TOTAL MONTHLY FLOWS GRAPH No. 5

Note: * denotes total annual flow in million gallons

TOTAL MONTHLY FLOWS (MILLION GALLONS)

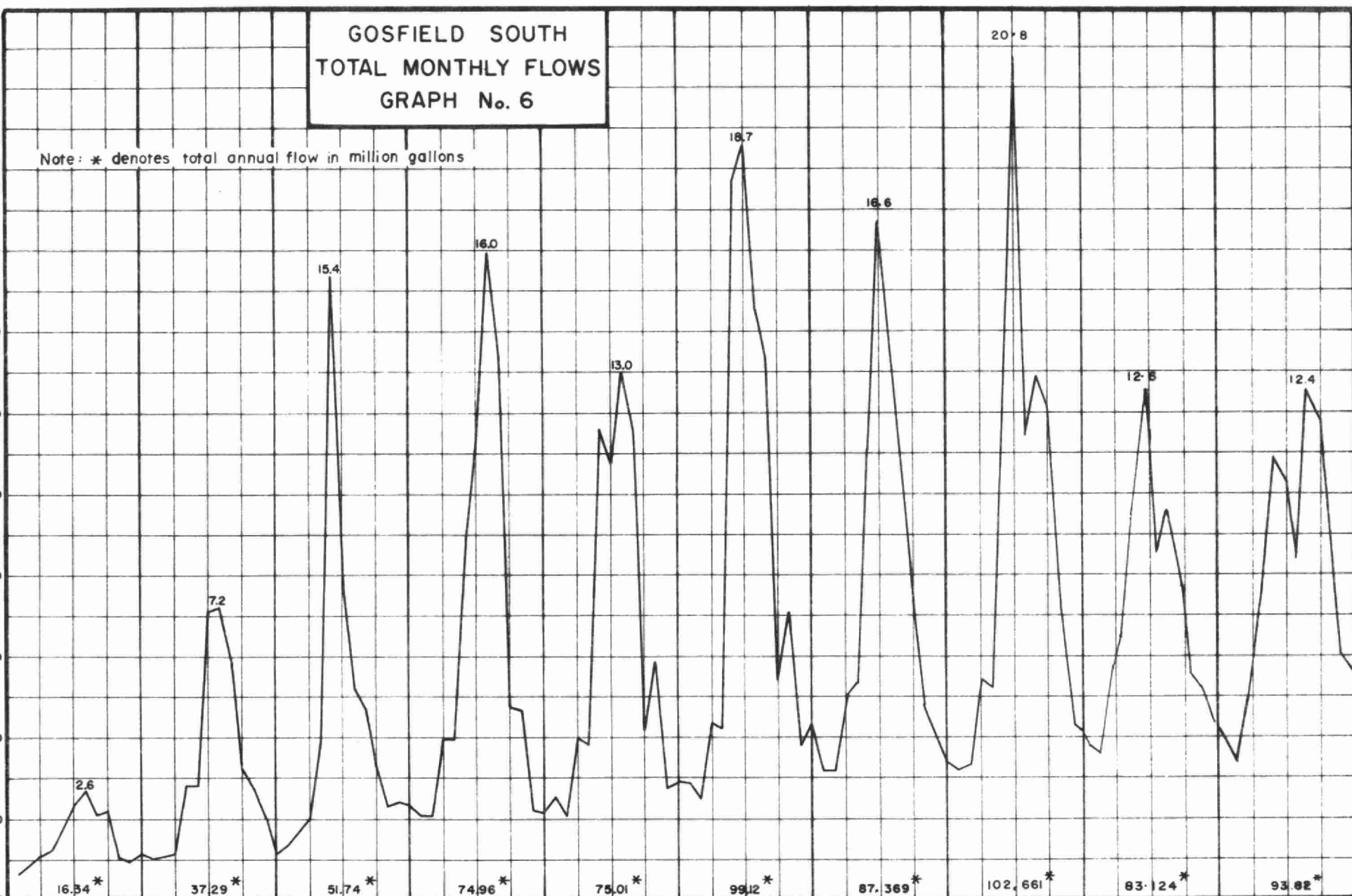


GOSFIELD SOUTH TOTAL MONTHLY FLOWS GRAPH No. 6

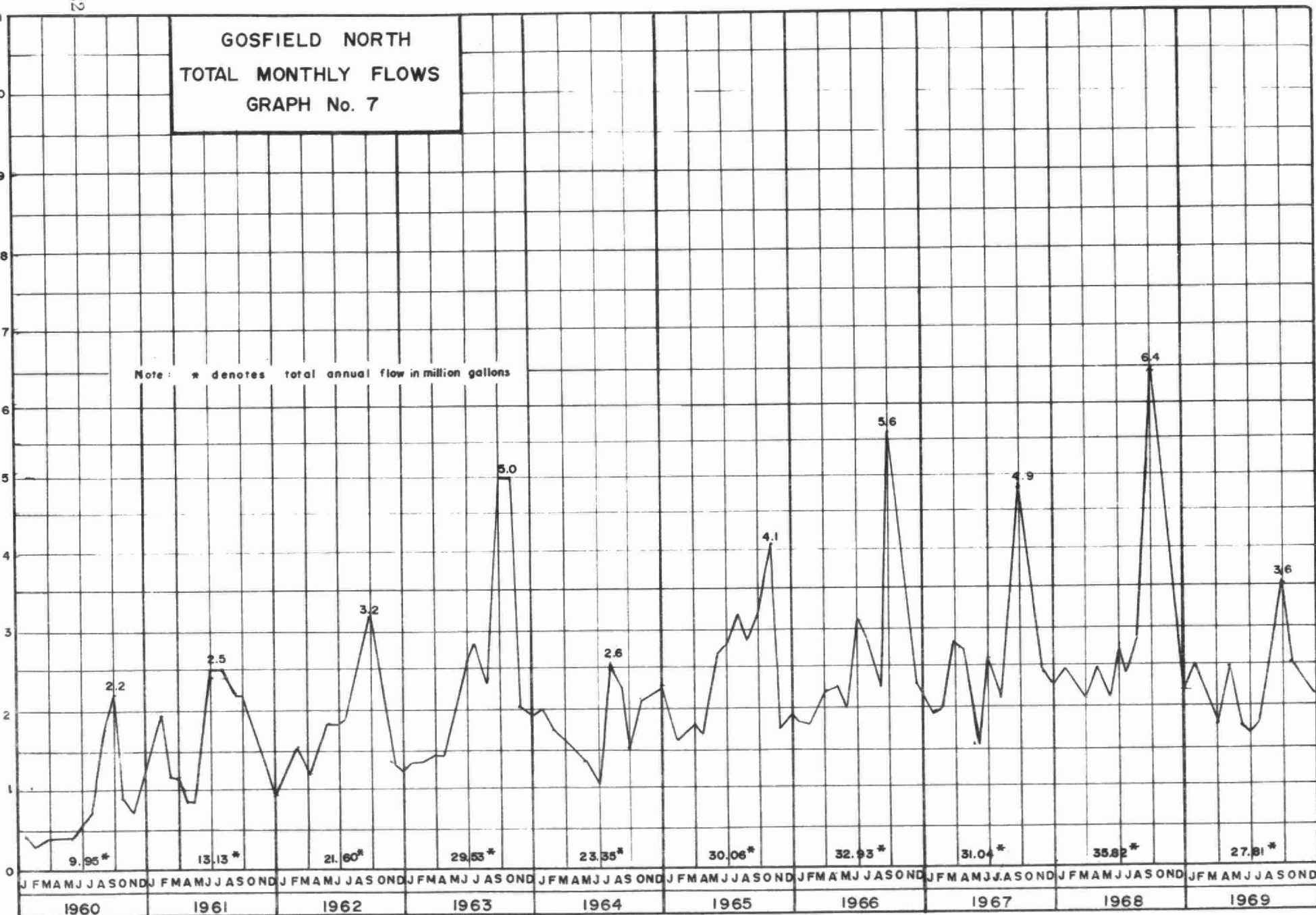
Note: * denotes total annual flow in million gallons

TOTAL MONTHLY FLOWS (MILLION GALLONS)

JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
1960 1961 1962 1963 1964 1965 1966 1967 1968 1969



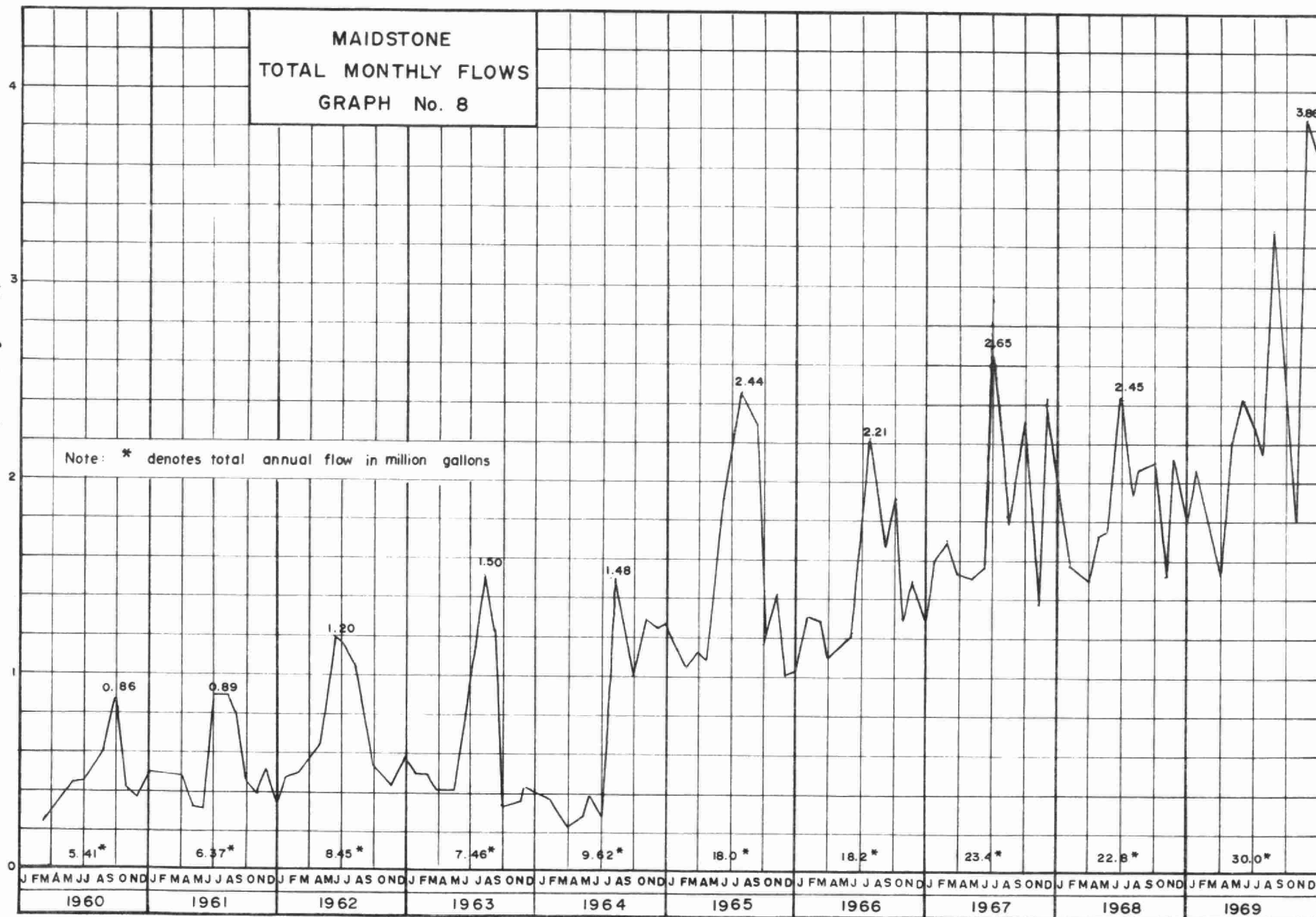
Note: * denotes total annual flow in million gallons



MAIDSTONE
TOTAL MONTHLY FLOWS
GRAPH No. 8

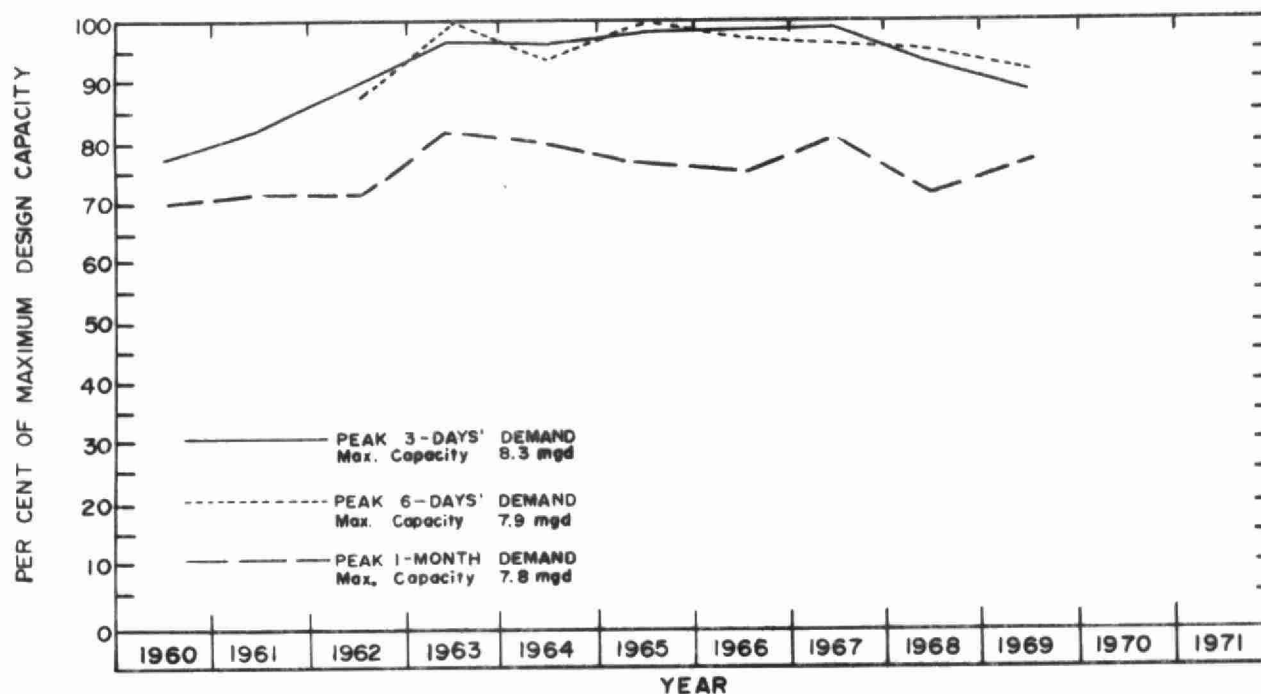
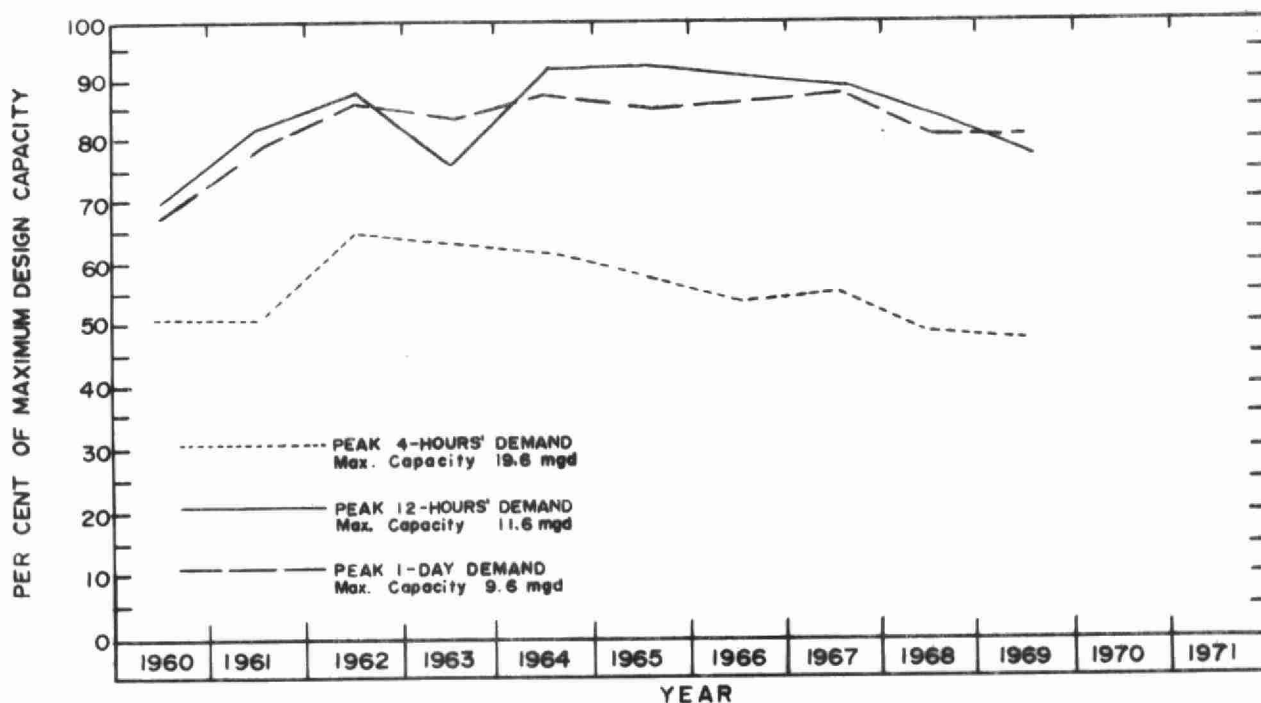
TOTAL MONTHLY FLOWS (million gallons)

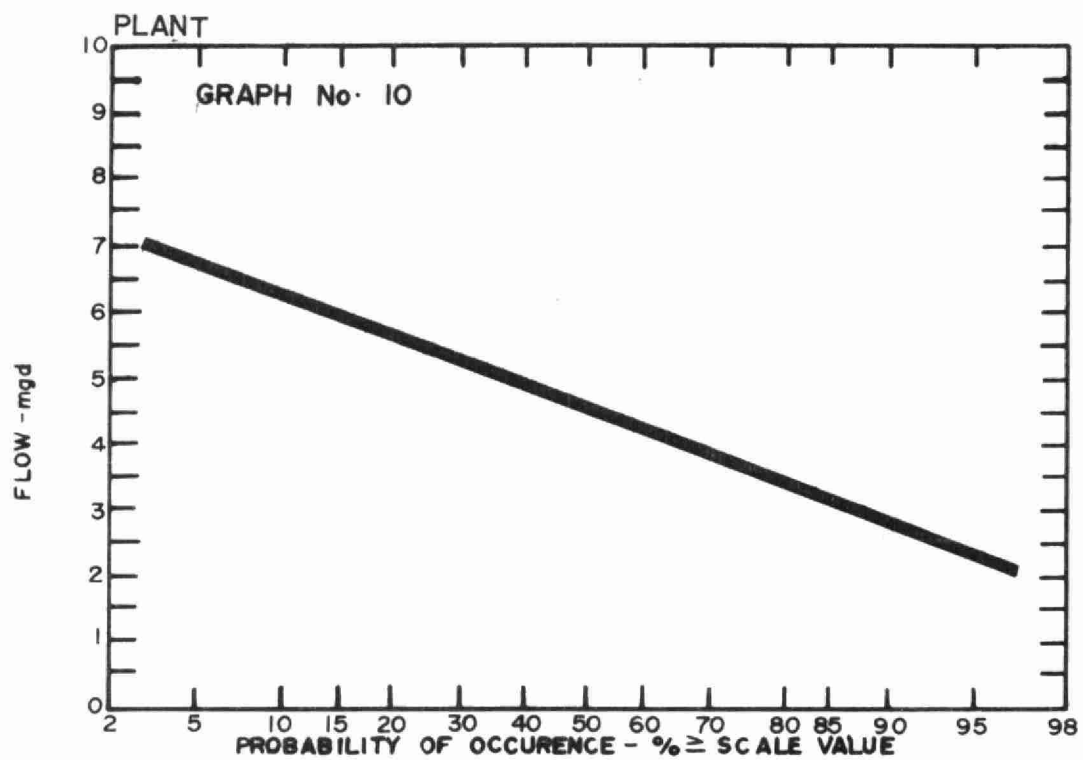
Note: * denotes total annual flow in million gallons



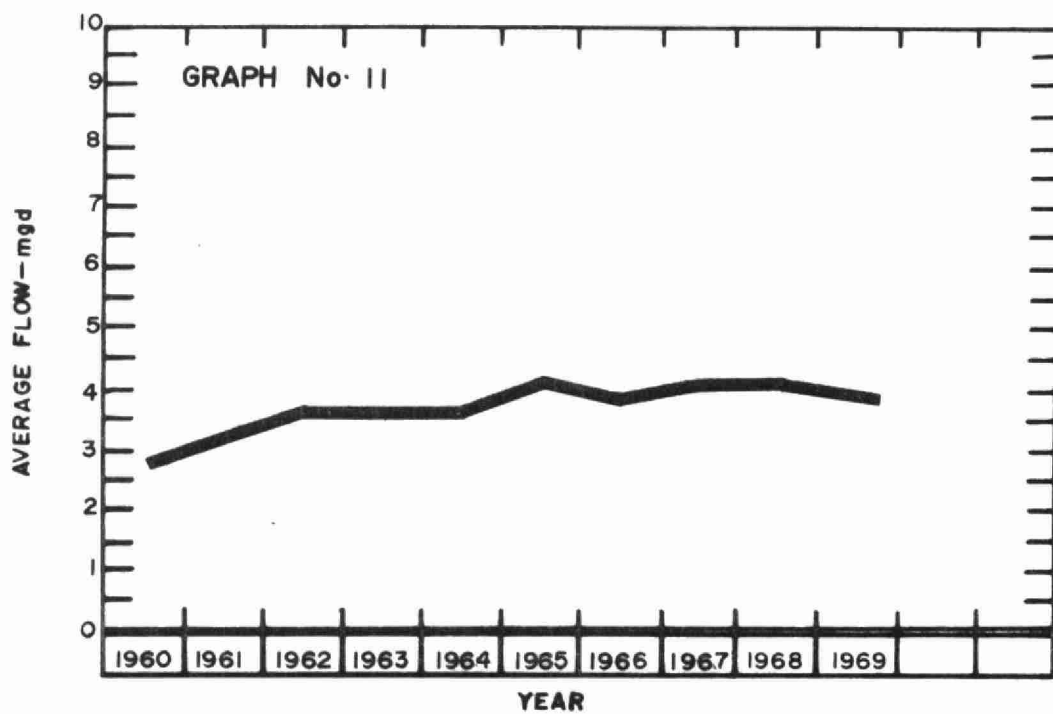
GRAPH No. 9 PEAK DEMAND AS A PERCENTAGE OF DESIGN CAPACITY
(BASED ON PLANT METER)

NOTE: DESIGN MAXIMUM CAPACITIES ASSUME IDEAL CONDITIONS AND DO NOT ALLOW FOR BACKWASHING, DOWN-TIME OF EQUIPMENT, OR PERIODS OF HIGH TURBIDITY AND ALGAE.



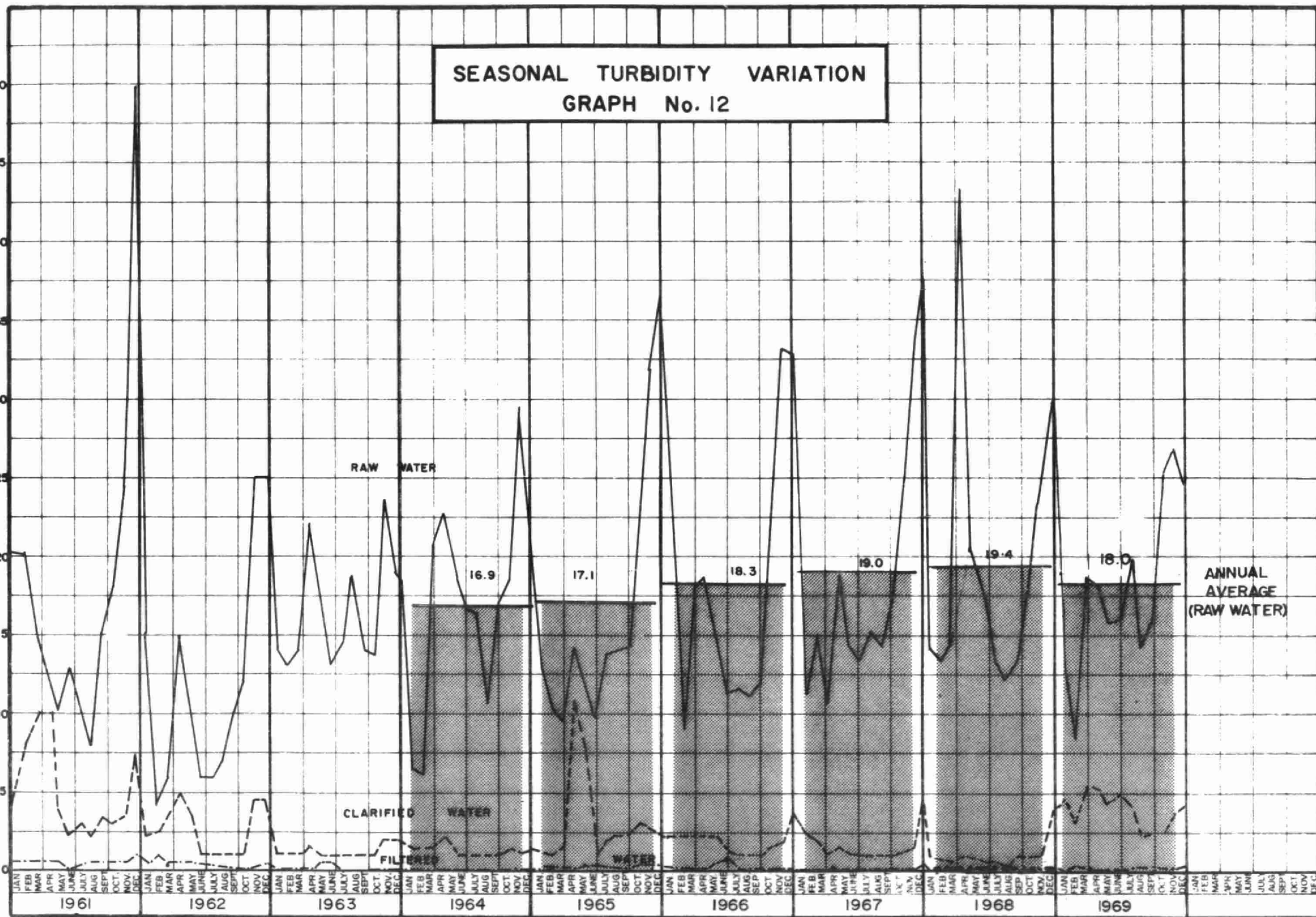


FL O W S



SEASONAL TURBIDITY VARIATION GRAPH No. 12

TURBIDITY - JTU



PROCESS CHEMICALS

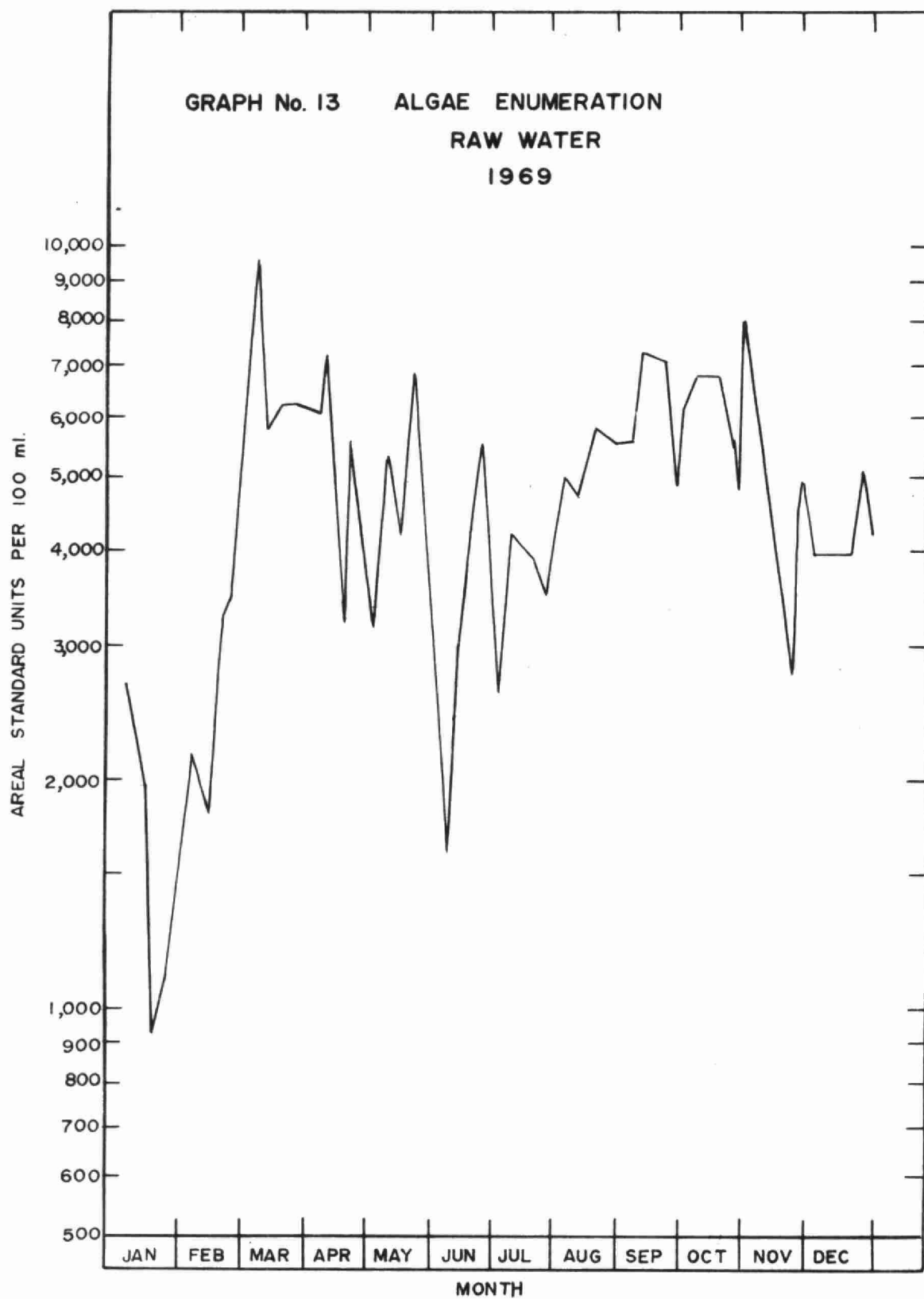
MONTH	ALUM		ACTIVATED CARBON		CHLORINATION		
	VOLUME USED gallons	DOSAGE mg/l	AMOUNT USED pounds	DOSAGE* mg/l	CHLORINE	DOSAGE	
					TOTAL USED 10 ³ pounds	PRE - CHLORINATION mg/l	POST - CHLORINATION mg/l
JAN	1778	18	0	0	1.6	1.3	0.4
FEB	0	-	0	0	1.5	1.5	0.5
MAR	1434	12	0	0	1.8	1.7	0.6
APR	2706	16	0	0	2.0	1.6	0.5
MAY	3334	18	0	0	2.9	1.9	0.6
JUNE	2814	14	70	1.4	3.4	2.1	0.7
JULY	3924	20	385	1.9	5.0	2.9	1.0
AUG	7375	23	480	1.9	7.7	3.4	1.1
SEPT	8330	25	650	2.4	6.6	2.7	0.9
OCT	5991	25	200	3.7	4.2	2.2	0.7
NOV	5198	25	0	0	2.1	1.3	0.4
DEC	5319	25	0	0	2.0	1.3	0.4
TOTAL	48023	-	1785	-	40.8	-	-
AVERAGE	4366	20	-	2.1	3.4	2.0	0.7

*Average mg/l when applied

**50% solution

WATER QUALITY

CHEMICAL PROPERTY	RAW WATER				TREATED WATER				DESIRABLE STANDARDS
	No. of Samples	Avg.	Max.	Min.	No. of Samples	Avg.	Max.	Min.	
HARDNESS mg/l CaCO_3	11	116	124	106	7	118	122	112	< 100
ALKALINITY mg/l CaCO_3	11	89	94	86	7	71	80	68	30-100
IRON mg/l Fe	11	1.19	2.70	0.60	7	0.08	0.25	0.05	<0.3
COLOUR Units	9	11	20	5	7	< 5	< 5	< 5	< 5
CHLORIDE mg/l Cl	11	22	32	17	7	25	29	22	<250
TURBIDITY JTU	365	18.0	61.0	7.0	365	0.2	2.0	0.2	<1.0
FLUORIDE mg/l F	9	.1	.2	.1	5	.1	.2	.1	<1.2
PHENOL	3	5.	8.	0	2	0	0	0	<1.



Month	COLIFORMS				ALGAE (Raw Water)			
	RAW WATER		TREATED WATER		No. Samples	*A. S. U./100 ml		
	No. Samples	No/100 ml Average	No. Samples	Density No. > 0/100 ml		Max.	Min.	Avg.
January	3	8045	44	0	4	2657	834	1659
February	4	68	45	0	4	3547	1855	2697
March	4	60	45	1	5	9452	6201	6258
April	5	499	57	0	4	7163	3360	5394
May	4	164	47	2	4	6765	3222	4871
June	4	45	45	0	5	5540	1638	3471
July	3	88*	45	0	4	4263	2653	3520
August	4	180	46	3	4	5756	4679	5237
September	5	259	71	10	5	7147	4895	6306
October	4	1933	49	4	4	6628	4765	6031
November	4	1436	48	1	4	7728	2664	5564
December	5	2290	59	0	5	5085	3847	4353
Total	49	-	601	21	52	-	-	-
Average	4	1121	50	-	4	-	-	4708

* One sample containing 80,00 not included

LABORATORY LIBRARY



96936000119897

Date Due

LABORATORY LIBRARY
ONTARIO WATER RESOURCES COMMISSION



Water management in Ontario